SeaWiFS Noise Reduction Correction

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1. Introduction

The second intermediate lunar calibration time series shows a noise that is essentially the same for all eight bands, as is shown in the figures *Lunar Calibration Time Series with Libration Corrections*. The pattern is easier to recognize in bands 1–6, where the change in radiometric response of the instrument with time is small. This correlated noise is a systematic error in the observations that is common to all of the bands. The primary systematic error is the uncertainty in the determination of the y-size of the Moon used in computing the oversampling correction.

2. Noise Reduction

An estimate of the correlated noise for each band can be obtained by computing the residuals of an exponential fit to the libration-corrected calibration time series. A noise reduction correction can be computed from these residuals and applied to the libration-corrected calibration time series. The correction should not change any time-dependences in the radiometric response of a given band. Since bands 4 and 5 show the smallest change with time, the noise reduction correction is computed from the mean of the noise residuals for those two bands. The correction has the form:

$$f_6(t,\lambda) \;=\; 1 \;-\; \frac{\frac{S_2(t,\lambda,\alpha,\gamma,l_{sc},b_{sc},l_{sun},b_{sun})}{S_2(0,\lambda,\alpha,\gamma,l_{sc},b_{sc},l_{sun},b_{sun})} \;-\; C(t,\lambda)}{C(t,\lambda)} \tag{1}$$

where:

S_2	$\equiv$	second intermediate, libration-corrected integrated radiances
$C(t)$	$\equiv$	linear fit to the second intermediate time series
t	$\equiv$	libration longitude correction coefficient
λ	$\equiv$	SeaWiFS band
α	$\equiv$	phase angle
γ	$\equiv$	track angle
l_{sc}	$\equiv$	longitude of the sub-spacecraft point
b_{sc}	$\equiv$	latitude of the sub-spacecraft point
l_{sun}	$\equiv$	longitude of the sub-solar point
b_{sun}	$\equiv$	latitude of the sub-solar point

A single exponential with a 1600 day period is used for the fits. The noise reduction correction is shown in the figure *SeaWiFS Noise Reduction Correction*.